



The Safety Element identifies the natural and manmade hazards that exist within the city. It seeks to mitigate their potential impacts, through both preventative and response measures, to ensure the continued health and safety of Lodi community members.

This Element addresses flooding and drainage; potentially hazardous materials and operations; seismic and geologic hazards; fire hazards; and emergency management. Potential health hazards related to air quality are addressed in Chapter 7: Conservation. Storm drain infrastructure related to flooding and drainage is discussed in Chapter 3: Growth Management and Infrastructure.

8.1 FLOODING AND DRAINAGE

Flood Zones

Based on revised flood risk evaluations prepared by the Federal Emergency Management Agency (FEMA) for the City of Lodi and San Joaquin County, effective October 19, 2009, flood hazards are a constraint to development only in two areas of the city: the area immediately adjacent to the Mokelumne River along the city's northern boundary, and the area around the White Slough Water Pollution Control Facility, the City's wastewater treatment facility, in the southwest corner of the Planning Area. As shown on Figure 8-1, these areas lie within Zone AE, meaning that they are subject to a 1% annual (100-year) flood. Flooding depths in this area are generally greater than three feet. No new development is planned within either of these areas.

Most of the city and the Planning Area lie within Zone X, which describes lands subject to the 0.2% annual (500-year) flood zone or that lie within the 100-year flood zone, but with flooding depths less than one foot. This suggests that these areas have a low susceptibility to major flooding, but would be inundated during a 500-year flood event. The remaining portions of the city and Planning Area are classified as Zone X, meaning that they lie outside the 500-year flood zone.

Dam Inundation

Large quantities of water stored in reservoirs along the Mokelumne, Calaveras, and Stanislaus River systems pose a potential threat to inhabitants of the Planning Area. Flooding could occur as a result of releases from reservoirs upstream of the Planning Area. Partial or complete failure of a dam along any of these rivers, especially the Mokelumne River, could cause inundation in the Planning Area. Dams that pose a direct threat to the Planning Area include Camanche, Camanche South and North Dikes, and Pardee Dam. The entire Planning Area would be inundated in the event of a failure of any of these dams, except for the Camanche North Dikes Dam, whose failure would just flood the Planning Area north of Kettleman Lane.



Drainage basins (top), Lodi Lake (middle), and the Woodbridge Irrigation Canal (bottom) help to drain stormwater.

Map of the City of Houston showing flood hazard areas. The map includes major roads like I-10, I-27, and I-69, and various local streets. Flood zones are color-coded: Zone AE (Special Flood Hazard Area subject to inundation by the 1% annual chance flood) in light blue, Zone X (1500) (Areas of 0.2% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood) in yellow, and Zone X (Areas determined to be outside the 0.2% annual chance flood) in white. The map also shows the Planning Area, Sphere of Influence, City Limits, and Urban Reserve. A legend in the bottom right corner explains these symbols. A scale bar in miles (0 to 4) and a north arrow are also present.

Source: Federal Emergency Management Agency, 2009.
Note: Flood Insurance Rate Maps are effective and regulatory as of October 16, 2009.

Flood Protection

Berms along the Mokelumne River were privately built and vary in height. Upstream of SR-99, the adjacent agricultural lands are protected against floods up to the 50-year currents by low discontinuous berms. Berm overtopping here from larger flood events (e.g. the 100-year flood) would not, however, cause inundation in the Planning Area. Berms west of SR-99 are higher and provide protection from flows slightly greater than the 100-year event. Should a major storm event cause berms to be over topped or if a berm or dam fails, flooding would occur. Flooding can also occur when runoff exceeds the capacity of local systems and cannot drain adequately. As long as berms are not over-topped and maintain their structural integrity, flooding is considered to be very unlikely.

San Joaquin County has prepared a Dam Failure Plan that identifies hazards to the county from dams and reservoirs. The Dam Failure Plan also identifies actions that will be taken to respond to flood-related emergencies in the event that flooding occurs. These actions would include implementation of the Standardized Emergency Management System and the County's Multi-Hazard Emergency Plan (see Section 8.5: Emergency Management for details).¹

Although major flooding is not anticipated, as existing agricultural and open space lands are converted to urban uses, there will be an increase in stormwater runoff from additional impervious surfaces. To minimize those impacts, General Plan policies seek to manage stormwater runoff, through the permitting process, good stormwater management practices (e.g. porous materials, cisterns, bioswales, etc.), and the construction of open spaces and drainage basins (see Chapter 6: Parks, Recreation, and Open Space).

8.2 POTENTIALLY HAZARDOUS MATERIALS AND OPERATIONS

This section focuses on human-made hazards associated with the exposure to hazardous materials, as well as fire, transportation, and utility corridor hazards. Hazardous wastes generated by both residents and businesses within the Planning Area contribute to environmental and human health hazards that have become an increasing public concern. However, proper waste management and disposal practices can minimize public concern over toxicity and the contamination of soils, water, and the air.

Hazardous Materials

As of May 2009, the State Water Resources Control Board reported an inventory of Leaking Underground Storage Tanks (LUST) and other (non-fuel) cleanup sites. The majority of the LUST sites have been remediated, with only nine sites listed as still "open" for remediation, monitoring, or assessment. These sites are described in a table in Appendix XXX and shown in Figure 8-2.

The California Integrated Waste Management Board (CIWMB) is responsible for managing California's solid waste stream. The CIWMB works in partnership with local government, industry, and the public to reduce waste disposal and ensure environmentally safe landfills are maintained. Table 8-1 and Figure 8-2 describe solid waste, recycling, and landfills facilities (including closed facilities).

¹ San Joaquin County, 2003.

TABLE 8-1: SOLID WASTE AND/OR RECYCLING FACILITIES AND LANDFILL SITES IN THE PLANNING AREA

SITE	ADDRESS
Solid Waste and Landfill	
Lodi City Landfill	N of Awani Dr and Mokelumne River Dr.
Central Valley Waste Services	1333 E. Turner Rd.
Valley Landscaping	1320 East Harney Ln.
Recycling Centers	
Pinos Recycling Co	741 S Cherokee Ln.
Tokay Recycling Center	60 S Cluff Ave.
Tomra Pacific Inc/Apple Market	1320 W Lockeford St.
Diaz Recycling	845 S Central Ave.
Nexcycle/Save Mart #209	610 W Kettleman Ln.
Tomra Pacific Inc/Food 4 Less	2430 W Kettleman Ln.
Nexcycle/Safeway #1648	2449 W Kettleman Ln.

Source: California Integrated Waste Management Board, 2007.



Plan policies seek to ensure the safe operation of storage tanks and potentially hazardous materials.



Lodi is served by three solid waste facilities and multiple recycling centers.

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Potentially Hazardous Operations

Airports and Airstrips

Airport-related hazards are generally associated with aircraft accidents, particularly during takeoffs and landings. Airport operation hazards include incompatible land uses, power transmission lines, wildlife hazards (e.g. bird strikes), and tall structures (e.g. traffic control towers). (Note that noise impacts are discussed in Chapter 9: Noise.)

Existing public use airports within or adjacent to the Planning Area include:

- Kingdon Airpark: seven miles southwest of downtown Lodi;
- Lodi Airpark: five miles southwest of downtown Lodi, near the intersection of Armstrong and Lower Sacramento roads (inside the Planning Area); and
- Ten private airstrips within or adjacent to the Planning Area.

The 2009 San Joaquin County Airport Land Use Plan provides information on existing and future operations, potential hazards, and land use compatibility. According to the Plan Kingdon Airpark is planning to extend its runway to permit more flights and aircraft types (i.e. from solely accommodating single-engine planes to allowing business jets and turboprop aircraft). No future improvements are anticipated at the Lodi Airpark. Given the distance of these airports from the city's boundaries, the airports do not present substantial hazards to people or property in Lodi.

The Plan's land use compatibility matrix and compatibility zone map is shown in Figure 8-3. The southeast portion of Lodi, south of Century Boulevard, lies within Zone 8: Airport Influence Area, which does not have any land use restrictions. A portion of the Urban Reserve General Plan area, along the north side of Hogan Lane, lies within Zone 7: Traffic Pattern. This classification prohibits outdoor stadiums and non-residential uses with densities greater than 450 persons per acre, and requires at least 10% open space.

Railroads

Potential hazards associated with railroads include collisions and train derailment. Either of these incidents can lead to human injury or death as well as causing various environmental impacts. The Federal Railroad Administration regulates railroad safety and provides oversight to the use of railroads.

Lodi is served by two national rail lines, Union Pacific Railroad and the Burlington Northern Santa Fe. The city is also served by a local railroad, Central California Traction, which runs contiguous to industrial areas. Daily passenger service via Amtrak is available from Lodi to San Francisco, Los Angeles, Sacramento and points between. A more detailed discussion of railroad operations and infrastructure may be found in Chapter 5: Transportation.

Utility Corridors

One of the primary causes of disruption to underground natural gas pipelines, which are present in the Planning Area, is external force damage that occurs during excavation activities. Such damage can create pipeline leaks or ruptures and lead to hazardous health and safety conditions. However, a national program is in place to prevent accidental pipeline damage caused by excavation. For areas adjacent to an underground utility pipeline, the U.S. Department of Transportation Office of Pipeline Safety requires that individuals contact the state "One-Call" center prior to beginning excavation. Advanced planning, effective use of these one-call systems, accurate locating and marking of underground facilities, and the use of safe-digging practices can all be effective in reducing underground facility damage and potentially hazardous conditions.

FIGURE 8-3: AIRPORT COMPATIBILITY ZONES



8.3 SEISMIC AND GEOLOGIC HAZARDS

In general, geologic and seismic hazards do not pose a substantial risk to development in Lodi or to overall public safety. The Central Valley is filled with a thick sequence of sediments eroded from the Sierra Nevada range to the east. The most recent deposits in the region are floodplain deposits, consisting of clay, silt, and some sand.

Seismicity

The Planning Area is located 65 miles east of the Bay Area and lies within Seismic Risk Zone 3. Earthquakes in Seismic Risk Zone 3 pose a lesser risk than those experienced in Zone 4 (such as the San Francisco Bay Area). The Planning Area may be affected by regionally occurring earthquakes; however, impacts resulting from such an event are not likely to be severe. Figure 8-4 identifies active and potentially active faults in and around the Planning Area.

Regional Faults

Lodi's nearest active fault is the Greenville Fault, located approximately 34 miles south of the Planning Area.² The Maximum Moment magnitude of the maximum probable earthquake on the Greenville Fault is estimated to be 6.9.³ Other faults close to the Planning Area exhibiting historic displacement (activity within the last 200 years) are the Concord-Green Valley and Hayward Faults located approximately 45 miles west-northwest and 56 miles west of the Planning Area, respectively. Portions of the Calaveras Fault zone also have been rated as being active within the last 200 years; those portions are located approximately 46 miles southwest of the site. The nearest Quaternary fault (2 million years ago to present) to the Planning Area showing evidence of activity within the past 1.6 million years is the San Joaquin Fault located approximately 24 miles southwest of the Planning Area.⁴ The nearest mapped fault trace, the Stockton Fault, is not considered an active fault.

² Jennings, 1994.

³ Peterson et al. 1996.

⁴ Jennings 1994; Bartow 1991.

Seismic Structural Safety

The greatest geologic hazard in Lodi is the structural danger posed by groundshaking from earthquakes originating outside of the area. During a high intensity event, some damage could occur to well-made structures and chimneys; some towers could fall; and poorly constructed or weak structures could be heavily damaged. The susceptibility of a structure to damage from ground shaking is related to the underlying foundation material. A foundation of rock or very firm material can intensify short-period motions, which affect low-rise buildings more than tall, flexible ones. A deep layer of saturated alluvium can cushion low-rise buildings, but it can also accentuate the motion in tall buildings. Other potentially dangerous conditions include, but are not limited to: building architectural features that are not firmly anchored, such as parapets and cornices; roadways, including column and pile bents and abutments for bridges and overcrossings; and above-ground storage tanks and their mounting devices.

The risk of surface fault rupture is considered low. The probability of soil liquefaction actually taking place in the Planning Area is considered to be a low to moderate hazard, due to the substantial distance from the active Hayward and Calaveras Fault zones and the type of ground shaking expected from those faults.

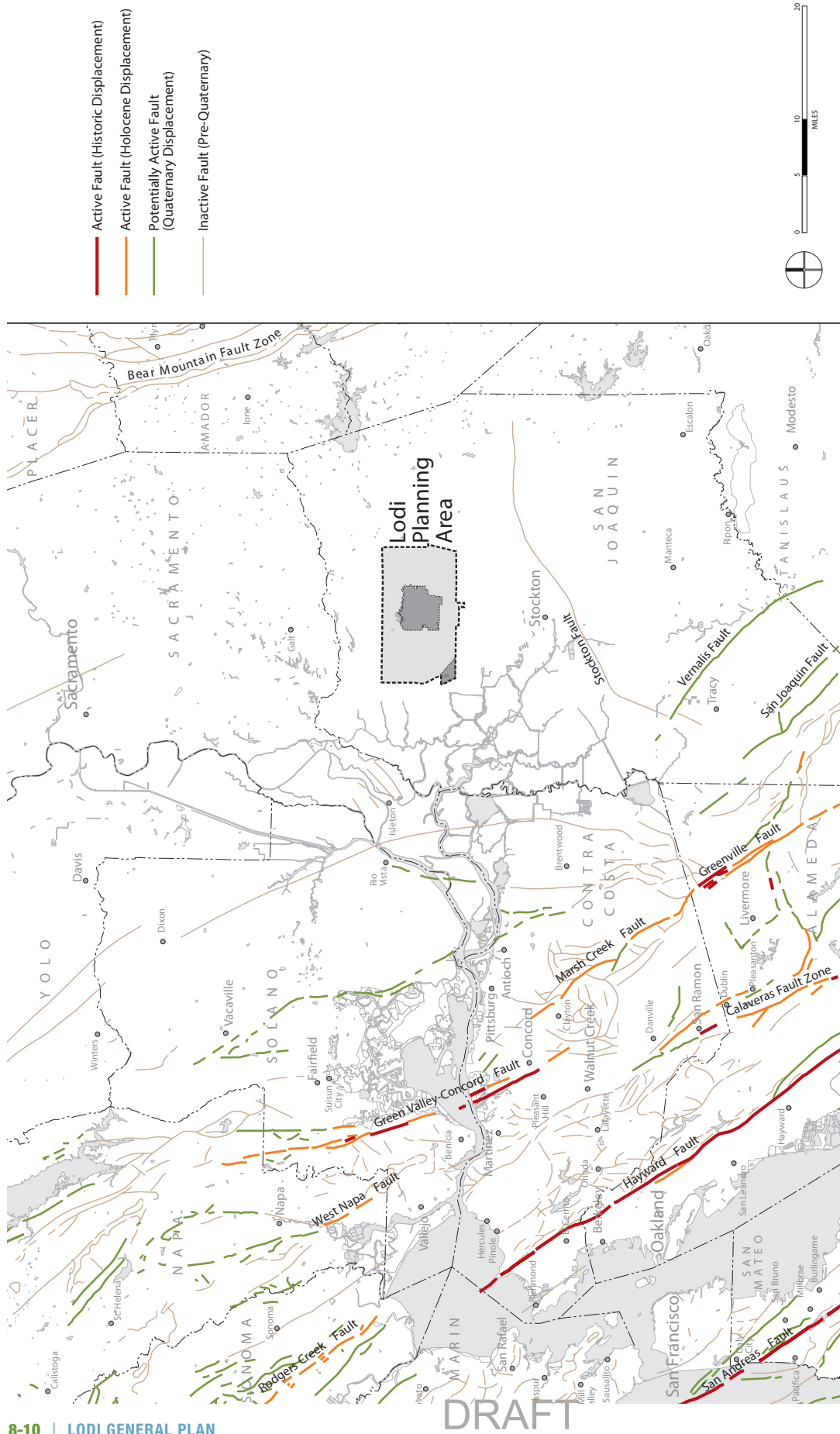
Other Geologic Hazards

Additional geologic hazards that may exist within the Planning Area include soil erosion and settlement. The Planning Area is primarily flat and thus the risk of unstable soils or landslides is considered relatively low.

Soil Erosion

Soil erosion is the process whereby soil materials are worn away and transported to another area either by wind or water. Rates of erosion can vary depending on the soil material and structure, placement, and the general level of human activity. Soil containing high amounts of sand or silt can be easily eroded while clayey soils are less susceptible. The Tokay soils present in the Planning Area have a moderate potential for wind erosion. The

FIGURE 8-4: REGIONAL FAULTS



Tujunga soils, found in more limited quantities in the Planning Area, have a severe potential for wind erosion if vegetative covering is removed.

Expansive Soils

Expansive soils are largely comprised of clay, which expand in volume when water is absorbed and shrink when dried. Structural damage may result over a long period of time, usually resulting from inadequate soil and foundation engineering or the placement of structures directly on expansive soils. Several of the soil types located within the Planning Area are comprised of potentially expansive materials. However, the majority of the Planning Area either has not been measured for soil shrink-swell or has a low potential for soil shrink-swell.

Settlement

Settlement is the consolidation of the underlying soil when a load, such as that of a building or new fill material, is placed upon it. When soil tends to settle at different rates and by varying amounts depending on the load weight, it is referred to as differential settlement. Settlement commonly occurs as a result of building construction or other large projects that require soil stockpiles. Areas of the Planning Area that contain fill material may be susceptible to settlement. If the fill materials are unconsolidated they have the potential to respond more adversely to additional load weights as compared to adjacent native soils.

8.4 FIRE HAZARDS

Both urban and wildland fire hazards exist in the Lodi Planning Area, creating the potential for injury, loss of life, and property damage. In the event of a fire, the Fire Department relies on sufficient water supply and pressure. The City's design standard for water transmission facilities is to provide 4,000 gallons per minute of flow at a minimum 45 pounds per square inch of pressure in pipes 8 inches and larger.

Urban Fire Hazards

Urban fires primarily involve the uncontrolled burning of residential, commercial, and/or industrial structures due to human activities. Factors that exacerbate urban structural fires include substandard building construction, highly flammable materials, delayed response times, and inadequate fire protection services.

Wildland Fire Hazards

The Planning Area is not characterized by significant areas of wildlands. As noted in Chapter 7: Conservation, less than one percent of the city's land area is identified as Native Riparian and four percent is identified as Native Vegetation. Additionally, the topography of the area is relatively homogenous; steep slopes that could contribute to wildland fires are not common. Data provided by the California Department of Conservation Fire and Resource Assessment Program indicates that the few areas within the Planning Area that are listed as "High" fire threat are in areas containing brush as the groundcover.

8.5 EMERGENCY MANAGEMENT

Public Safety Departments

The Lodi Police and Fire departments manage public safety in Lodi, with the Fire Department leading emergency preparedness and planning.

The Fire Department provides a wide range of emergency and non-emergency services, including fire suppression, emergency medical services, hazardous materials response, technical rescue, fire prevention, public education, and related safety services. The Emergency Operations Center, located at the Police department building, serves as the center of the city's emergency operations. City operations remain in compliance with the National Incident Management System, a comprehensive national approach to incident management, applicable to federal, state, and local governments and the Standardized Emergency Management System, which provides a strategy and framework to address multi-agency and multi-jurisdictional emergencies in California.

As of 2008, the Fire Department had 59 personnel, including 51 firefighters, company officers, or battalion chiefs. The city of Lodi has an Insurance Services Office (ISO) rating of Class 3. A Class 3 ISO rating indicates that the Fire Department is strategically placed throughout the City, and has adequate personnel, equipment, and expertise to serve the current population. In 2006, the most recent year of data availability, the department met the self-imposed National Fire Protection Association's response time criteria of 6 minutes for 90% of all calls.

The Police Department's basic responsibility is to protect and serve the public and property within Lodi, through crime prevention, investigation, and other services. As of 2008, the Police Department had 118 full-time employees and 120 volunteers, with 78 sworn officers.

Emergency Planning

The City has adopted the San Joaquin County Hazard Mitigation Plan. This plan identifies measures to reduce the impacts of natural and manmade hazards and to

facilitate the recovery and repair of structures if damage should occur from hazardous events. Adoption of the plan ensures that Lodi is eligible for certain federal and State funds for disaster recovery in case of such an event.

Evacuation Routes and Safety Standards

The City provides street standards for all street types, thus ensuring appropriate standards for emergency access and evacuation. For example, the standards specify roadway widths of 30 feet (curb-to-curb) for minor residential streets and 52 feet for major collector streets.

8.6 POLICIES

GUIDING POLICIES

- S-G1** Ensure a high level of public health and safety.
- S-G2** Prevent loss of lives, injury, illness, and property damage due to flooding, hazardous materials, seismic and geological hazards, and fire.
- S-G3** Protect the public from disasters and provide guidance and response in the event a disaster or emergency.
- S-G4** Minimize vulnerability of infrastructure and water supply and distribution systems.

IMPLEMENTING POLICIES

Flooding and Drainage

- S-P1** Continue to participate in the National Flood Insurance Program and ensure that local regulations are in full compliance with standards adopted by FEMA.
- S-P2** Cooperate with appropriate local, State, and federal agencies to address local and regional flood issues and dam failure hazards.
- S-P3** Require adequate natural floodway design to assure flood control in areas where stream channels have been modified and to foster stream enhancement, improved water quality, recreational opportunities, and groundwater recharge.
- S-P4** Prohibit new development, except for public uses incidental to open space development, within Zone A (100-year flood zone), as shown on Figure 8-1.
- S-P5** Site critical emergency response facilities—such as hospitals, fire stations, police offices, substations, emergency operations centers and other emergency service facilities and utilities—to minimize exposure to flooding and other hazards.

S-P6

Update Zoning Ordinance and development review process as needed to reduce peak-hour stormwater flow and increase groundwater recharge. These may include provisions for:

- Constructing parking areas and parking islands without curbs and gutters, to allow stormwater sheet flow into vegetated areas.
- Grading that lengthens flow paths and increases runoff travel time to reduce the peak flow rate.
- Installing cisterns or sub-surface retention facilities to capture rainwater for use in irrigation and non-potable uses.

S-P7

Update City street design standards to allow for expanded stormwater management techniques. These may include:

- Canopy trees to absorb rainwater and slow water flow.
- Directing runoff into or across vegetated areas to help filter runoff and encourage groundwater recharge.
- Disconnecting impervious areas from the storm drain network and maintain natural drainage divides to keep flow paths dispersed.
- Providing naturally vegetated areas in close proximity to parking areas, buildings, and other impervious expanses to slow runoff, filter out pollutants, and facilitate infiltration.
- Directing stormwater into vegetated areas or into water collection devices.
- Using devices such as bioretention cells, vegetated swales, infiltration trenches and dry wells to increase storage volume and facilitate infiltration.
- Diverting water away from storm drains using correctional drainage techniques.

Hazardous Materials and Operations

S-P8

Require that all fuel and chemical storage tanks are appropriately constructed; include spill containment areas to prevent seismic damage, leakage, fire and explosion; and are structurally or spatially separated from sensitive land uses, such as residential neighborhoods, schools, hospitals and places of public assembly.

S-P9 Ensure compatibility between hazardous material users and surrounding land use through the development review process. Separate hazardous waste facilities from incompatible uses including, but not limited to, schools, daycares, hospitals, public gathering areas, and high-density residential housing through development standards and the review process.

S-P10 Consider the potential for the production, use, storage, and transport of hazardous materials in approving new development. Provide for reasonable controls on such hazardous materials. Ensure that the proponents of applicable new development projects address hazardous materials concerns through the preparation of Phase I or Phase II hazardous materials studies, as necessary, for each identified site as part of the design phase for each project. Require projects to implement federal or State cleanup standards outlined in the studies during construction.

S-P11 Regulate the production, use, storage, and transport of hazardous materials to protect the health of Lodi residents. Cooperate with the County and Lodi Fire Department in the identification of hazardous material users, development of an inspection process, and implementation of the City's Hazardous Waste Management and Hazardous Materials Area plans. Require, as appropriate, a hazardous materials inventory for project sites, including an assessment of materials and operations for any development applications, as a component of the development environmental review process or business license review/building permit review.

S-P12 Work with waste disposal service provider(s) to educate the public as to the types of household hazardous wastes and the proper methods of disposal and shall continue to provide opportunities for residents to conveniently dispose of household hazardous waste.

S-P13 Continue to follow the County Comprehensive Airport Land Use Plan for guidelines on land use compatibility near airports, land use restrictions, and to ensure public safety.

S-P14 Support grade-separated railroad crossings, where feasible, and other appropriate measures adjacent to railroad tracks to ensure the safety of the community.

S-P15 Continue to mark underground utilities and abide by federal safe-digging practices during construction.

Seismic and Geologic Hazards

S-P16 Ensure that all public facilities, such as buildings, water tanks, underground utilities, and berms, are structurally sound and able to withstand seismic activity.

S-P17 For buildings identified as seismically unsafe, prohibit a change in use to a higher occupancy or more intensive use until an engineering evaluation of the structure has been conducted and structural deficiencies corrected consistent with City building codes.

S-P18 Require soils reports for new projects and use the information to determine appropriate permitting requirements, if deemed necessary.

S-P19 Require that geotechnical investigations be prepared for all proposed critical structures (such as police stations, fire stations, emergency equipment, storage buildings, water towers, wastewater lift stations, electrical substations, fuel storage facilities, large public assembly buildings, designated emergency shelters, and buildings three or more stories high) before construction or approval of building permits, if deemed necessary. The investigation shall include estimation of the maximum credible earthquake, maximum ground acceleration, duration, and the potential for ground failure because of liquefaction or differential settling.

- S-P20** Require new development to include grading and erosion control plans prepared by a qualified engineer or land surveyor.

Fire Hazards

- S-P21** Maintain a vegetation management program to ensure clearing of dry brush areas. Conduct management activities in a manner consistent with all applicable environmental regulations.

Emergency Management

Policies related to police and fire facilities are addressed in Chapter 3: Growth Management and Infrastructure.

- S-P22** Coordinate with local, State, and Federal agencies to establish, maintain, and test a coordinated emergency response system that addresses a variety of hazardous and threatening situations. Conduct periodic emergency response exercises to test the effectiveness of City emergency response procedures. Develop and implement public information programs concerning disaster response and emergency preparedness and develop mutual aid agreements and communication links with surrounding communities for assistance during times of emergency.
- S-P23** Maintain and periodically update the City's Emergency Preparedness Plan, including review of County and State emergency response procedures that must be coordinated with City procedures.
- S-P24** Ensure that major access and evacuation corridors are available and unobstructed in case of major emergency or disaster. Continue to identify appropriate road standards, including minimum road widths and turnouts to provide adequate emergency access and evacuation routes.
- S-P25** Continue to use the San Joaquin County Hazard Mitigation Plan to reduce hazard risk and coordinate with the County on its update and implementation, consistent with the Federal Emergency Management Agency and the Disaster Act of 2000.

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